

## **REMARKS**

### **Status of case**

Claims 1 through 20 are pending.

### **Claim Rejections under 35 U.S.C. § 101**

Claims 6 and 12 were rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. Applicants amend the specification to the following: "The video decoding program 390 is provided, for example, by recording media such as CD-ROM, DVD, ROM, [[etc.,]] or by semiconductor memories."

### **Claim Rejections under 35 USC §103**

Claims 1, 2, 6-8, and 12 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,272,177 (Murakami) in view of U.S. Patent No. 7,227,901 (Joch). Claims 3, 5, 9, and 11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami in view of Joch and further in view of U.S. Patent Application No. 2002/0146072 (Sun). Claims 4 and 10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami in view of Joch and further in view of Shen et al., "Adaptive Motion Vector Resampling for Compressed Video Down Scaling," IEEE 1997.

#### **1. Lack of teaching of interpolation**

The claims as currently presented are directed to interpolation. Specifically, claim 1 recites "generating a prediction reference image that are formed by providing interpolated pixels which are produced by interpolation between integer pixels of a reference frame in a predetermined region of the reference frame" "wherein said filtering pixel is said interpolated pixel which have pixel values produced by applying the low-pass filter having the narrower spectral band-pass in low frequency band of said two low-pass filters to neighborhood integer pixels." See also claims 2, 6-8, and 12.

The Murakami and Joch references, in contrast, fail to teach or even suggest anything about interpolation. In fact, the Murakami and Joch references do not even include any mention of "interpolate" or "interpolation". Rather, the Murakami and Joch references are directed to modification of the original image. Moreover, apart from failing to teach interpolation as a general matter, the Murakami and Joch reference do not specifically teach any determination of the number of interpolated pixels depending on the complexity of the image. Applicants further

present dependent claims 13-20. For this reason alone, the claims as currently presented distinguish over the cited references.

**2. Lack of teaching of analysis of complexity to determine the number of pixels.**

The complexity of the blocks (as compared to a reference frame) determines the number of pixels for the predicted image. See claim 1 (“complexity extraction means for extracting complexity information which indicates a degree of complexity of movement between said coding target frame and said reference frame for each of the plurality of blocks” and “predicted image generating means for determining the number of filtering pixels depending on said complexity information for each of the plurality of blocks on basis of a predetermined rule, wherein said filtering pixel is said interpolated pixel which have pixel values produced by applying the low-pass filter having the narrower spectral band-pass in low frequency band of said two low-pass filters to neighborhood integer pixels”); see also 2, 6-8 and 12.

In particular, in blocks in which the variation from the reference frame is small, the predicted image is generated by using the high resolution prediction reference image having a reduced number of filtering pixels. Thus, the precision of the motion compensation prediction is improved, and redundancy is reduced. Conversely, in blocks in which variation from the reference frame is large, the predicted image is generated using an increased number of filter pixels. In this way, the difference between the predicted image and the processing target block is reduced, thereby reducing redundancy. Thus, by flexibly varying the number of filtering pixels in accordance with the variation from the reference frame for each block of the coding target frame, encoding efficiency is improved. For example, the present application discusses two different pixel interpolations: 1/2 pixel interpolation and 1/4 pixel interpolation. Depending on the complexity of the target block as compared to a reference frame, either the 1/2 pixel interpolation or the 1/4 pixel interpolation are selected.

In contrast to this, neither the Murakami reference nor the Joch reference, either alone or in combination, teaches this aspect. As acknowledged in the Office Action, the Murakami fails to teach “predicted image generating means for determining a number of pixels . . . .” Instead, the Murakami reference teaches generating a difference signal 32, which is the difference between the input image signal 12 and the motion compensation predictive signal 14. Col. 9, lines 13-16. The difference signal 32 is normalized and then used to determine which frequencies to filter.

The Joch reference likewise does not analyze complexity in order to determine the number of pixels. Instead, the Joch reference teaches, as its final step of the decoding process, analyzing the “smoothness” of the block boundary. If the boundary is not smooth, “a 3-tap filter is used to filter only a single pixel on that side of the boundary 47.” Otherwise, a 5-tap filter is used to filter three pixels. Figure 5 (reproduced below) illustrates the selection of the 3-tap or 5-tap filter:

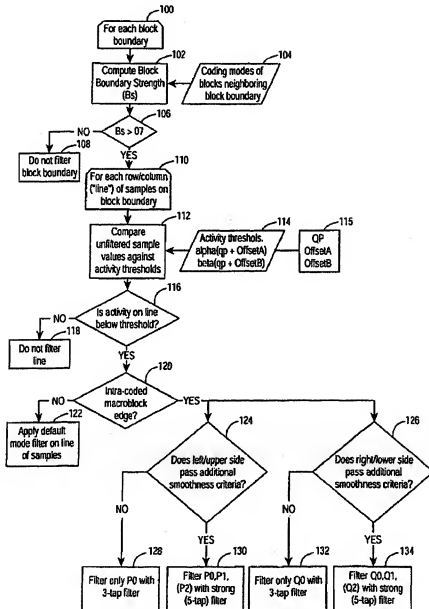


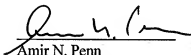
Figure 5

Applicants thus respectfully disagree that the Joch reference teaches any analysis of complexity in order to determine the number of pixels. Instead of a complexity analysis, the Joch reference teaches whether the edge of the block is "smooth." Specifically, the Joch reference teaches that the edge of the block is compared with an adjacent block to determine the "smoothness." If the edge of the block is not smooth, the filtering step is for the express purpose of "reduc[ing] blocking artifacts that are introduced by the coding process." Col. 12, lines 5-7. In order to do this, a 3-tap filter (instead of a 5-tap filter) is used. The 3-tap filter has fewer filter coefficients than the 5-tap filter, and therefore has a more gradual rolloff than a 5-tap filter (more effectively "smoothing" the boundary between the blocks. Further, even if one were to assume that the "smoothness" of the edge of a block is akin to the complexity analysis as claimed, the Joch reference still fails to teach that the number of pixels is selected based on this "smoothness" analysis. In particular, the Joch reference teaches that the number of pixels is the same whether the 3-tap filter or the 5-tap filter is used. The only difference is which pixels are filtered (not the number of pixels). For example, the 3-tap filter filters pixel 0 (P0) and the 5-tap filter filters pixels 0, 1, and 2 (P0, P1, and P2). Joch thus teaches that the number of pixels is the same whether the 3-filter tap or the 5-filter tap is used (*e.g.*, P0, P1, and P2 are present if either filter is used). Therefore, Applicants contend that the claims as currently presented distinguish over the references of record.

**SUMMARY**

Applicant respectfully requests early allowance of this application. The Examiner is invited to contact the undersigned attorneys for the Applicant via telephone if such communication would expedite this application.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Amir N. Penn", written over a horizontal line.

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